4.0 SNAKE RIVER SOCKEYE ESU

4.1 POPULATION

4.1.1 Redfish Lake Sockeye

The only extant population of the anadromous form of the endangered Snake River Sockeye is the Redfish Lake population in Idaho. The results of the analysis of habitat condition and potential to improve the status of this population are summarized in Table 4-1.

Table 4-1. Snake River Sockeye (yearlings) Ecological Improvement Potential

Data Sources

		①		②		③		④	⑤
	1 Population	Index of Potential to Increase Population: H/M/L (base period abundance/productivity estimate; recent abundance/productivity estimate or % Interim Target)	C S T N	Qualitative Assessment (CHART, NWFSC approach and other info) of Potential to Improve/Increase Habitat (H/M/L)	C S T N	Primary Candidate Anthropogenic Limiting Factors: **F**low, **C**hannel **M**orphology (bed, banks, sediment, LWD, sinuos., connectiv.), **T**emperature, **W**ater **Q**uality	C S T N	Ecological Improvement Potential	Improvement Potential Adjusted Based on Practical Constraints
1 SRRED	Redfish Lake	H (749;32)[1]		M		F, T (Migration Corridor Flows)		M	L

[1]Sockeye base periods are based on average annual fish counts.

C S T N = Council, States, TRTs, NWC

4.1.1.1 Background

This represents the southernmost population of sockeye salmon in the world and a run that travels the greatest distance from the Pacific Ocean (approximately 900 miles) and to the highest elevation (6,500 feet above sea level) (Bjornn *et al.* 1968; Foerster 1968). Historically, sockeye salmon runs were found in the Stanley Lakes basin, Payette Lake, Warm Lake, Wallowa Lake (Waples *et al.* 1991), and possibly Opal Lake in Idaho's Panther Creek drainage (Roberts, personal communications). In 1934, the 30-foot-high Sunbeam Dam (1910-1934) was partially removed from blocking the sockeye salmon migrations to and from the Stanley Lakes basin. Prior to that, historical sockeye salmon runs to Redfish Lake may have been sustained by an inadequate fish ladder and a diversion tunnel (Waples et al. 1991), as well as downstream lakes (e.g., Sullivan Lake) functioning as refugia (Foerster 1968). Based on very low levels of adult sockeye returns to Stanley, Pettit, and Yellow Belly lakes, IDFG made the decision to develop these lakes for resident species sport fisheries (IDFG 1959). Yellow Belly, Pettit, and Stanley lakes were chemically treated, but Alturas and Redfish lakes were not. so IDFG actions had no impact on Alturas and Redfish lake sockeye populations. IDFG's fishery management strategy was to establish a year-round sport fishery in the lakes in the Stanley Basin. Kokanee salmon were stocked by IDFG in Redfish Lake as early as the 1920s (Bowler 1990). Adult sockeye counts at Redfish Lake over a 10-year period (1955-1965) ranged from 4,361 in 1955 to 11 in 1961, with the average return being 749 (Bjornn *et al*. 1968). Adult returns between 1992 and 2002 (including broodstock returns from 1999 to 2002) ranged from zero in 1995 and 1997 to 257 in 2000, with the average run at 32 adults. These average return numbers are used below as the best available data for "the base period" and "the most recent 10-year period."

The analysis completed by the Northwest Fisheries Science Center indicated that the candidate limiting factors - sediment, riparian condition, and diversions - had little impact on sockeye, or sockeye did not seem significantly affected by changes to these habitat factors. As a matter of fact, these habitat factors did not appear to have been greatly altered. So Redfish Lake sockeye tributary habitat has not been significantly compromised, and the fish show little response to the lack of change. Opportunities for rearing habitat improvement for this ESU are likely to be low. However, analyses relating to water diversions for this population have not been completed (NWFSC 2004).

Habitat in the mainstem between the confluences of the North Fork Salmon and Pahsimeroi rivers is primarily limited by a modified hydrologic regime, inadequate pool/riffle ratios, and structural migration barriers (NWPPC 2004f). Tributaries are disconnected by irrigation diversions that greatly diminish the instream flows and leave smolts without most thermal refugia in the mainstem Salmon River migratory corridor between the cities of Salmon and Challis, Idaho. The natural hydrologic regime in the upper mainstem Salmon River (from the East Fork confluence to the headwaters) is also altered by streamflow withdrawals. The effects from these pressures include a reduction in base flow conditions and some modifications to flow timing (NWPPC 2004f). Sockeye survival decreases significantly in conjunction with decreases in Salmon River mean flows during the month of May (Arthaud *et al.* 2004).

Sockeye salmon inadvertently enter irrigation systems when the systems are turned on before fish screens are in place, when diversions and control structures are in operation, and when there is "backdoor access" provided by wastewater return flows and breeched ditches. Upon entering the hydrologically unstable irrigation system, fish are subject to threats from dewatering (e.g., increased temperatures, reduced forage, increased predation, no water, etc.) (NWPCC 2004b).

The diversion and subsequent return of irrigation water and reductions in riparian shading are the primary factors contributing to increased temperatures in the mainstem Salmon River in the 12-mile section upstream to Challis (NWPCC 2004b). Along the Salmon River, diking, alluvial groundwater pumping, and encroachment by residential and road development have reduced access to sloughs, side channels, and springs that are heavily influenced by cooler groundwater sources, compounding the thermal stresses of the mainstem and reducing the area of thermal refugia along the migratory route. Legacy forestry, irrigation, and existing grazing and forestry practices have also contributed to major tributary warming, which in turn results in warming of the mainstem Salmon River. Chemical contamination, including inputs of heavy metals and other toxicants from historical and extant mining districts in the Yankee Fork and Panther Creek drainages, may also interfere with the extraordinary migrations and homing of the Redfish Lake population of Snake River sockeye salmon between Idaho and the Pacific Ocean.

In Table 4-1, *Index of Potential to Increase Population* (column 1) was rated high based on the difference in average adult counts between the base period and the most recent 10-year period (749/32). *The Qualitative Assessment of Potential to Improve/Increase Habitat* (column 2) was rated moderate due to the potential for flow improvements and increased irrigation efficiency to increase mainstem migration corridor survival.

Ecological improvement potential was rated moderate based upon the degree of degradation of habitat from historical conditions in relation to the difference between the 32% baseline and 100% recent adult counts (240/32). The 32% upper limit from habitat gains was adapted from the Middle Fork Salmon River spring/summer chinook data.[1] As Redfish Lake sockeye migrate through the upper Salmon River (flows impacted > than Middle Fork), it is reasonable to assume, at a minimum, that the out-of-basin impacts to which Redfish Lake sockeye are exposed are similar to those experienced by Middle Fork chinook salmon populations, and potential habitat gains would also be comparable.

4.1.1.2 Suggested Offsets and Constraints

Specifically, maintaining discharges of 80-100% of mean May Salmon River flows is likely to result in an approximate 20% increase in downstream sockeye detections (Arthaud *et al.* 2004). In Table 4-1, *Improvement Potential Adjusted Based on Practical Constraints* (column 5) was rated low due to heavy reliance upon the willingness of private landowners to modify land and water uses and the expense associated with habitat improvements in the migration corridor. However, some opportunities with willing landowners and water users are available for reconnecting tributaries between Salmon and Stanley, Idaho to the mainstem Salmon River via improvements to irrigation diversion dams (e.g., converting from push-up dams with native substrate, high instream maintenance requirements, and fish passage obstructions to permanent diversion structures that provide low-flow fish passage and less instream disturbance for operations and maintenance), irrigation system efficiency (e.g., conversion of flood irrigation to sprinkler systems), point-of-diversion and conveyance consolidations, and increased conveyance efficiency (e.g., convert from losing ditches to pipelines, where feasible) without giving up agricultural production and reducing property values.

[1] This evaluation is based upon status trajectories of populations in nearby wilderness areas. In those areas, despite relatively unchanged habitat conditions, populations have declined to 32% of the abundance levels observed in the base period of the 1950s and 1960s. This suggests that the decline of populations is being significantly affected by factors outside of the tributary subbasin. Given the proximity of this subbasin to those wilderness subbasins and the similarity in life histories of the populations, it is reasonable to assume that improvement potential in this subbasin would be similarly constrained by those exogenous factors driving population declines in the wilderness areas. Consequently, it is likely that increases in population survival resulting from habitat improvement in this subbasin would be limited by factors outside of the subbasin to no more than approximately 32% of the population's observed survival level in the reference period (1950s and 1960s).

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